

M. ELDIB, F. DEBOEVERIE, D. VAN HAERENBORGH, S. BEN ALLOUCH, W. PHILIPS, H. AGHAJAN. **Out-of-home activity analysis using a low-resolution visual sensor.** *Gerontechnology* 2016; 15(suppl):79s; doi:10.4017/gt.2016.15.s.825.00

Purpose Loneliness and social isolation are probably the most prevalent psychosocial problems related to aging. One critical component in assessing social isolation in an unobtrusive manner is to measure the out-of-home activity levels, as social isolation often goes along with decreased physical activity, decreased motoric functioning, and a decline in activities of daily living, all of which may lead to a reduction in the amount of time spent out-of-home. The socialization level and loneliness have been studied previously¹ by detecting visitors.

Method In this work, we propose to use a single visual sensor for detecting out-of-home activity. The visual sensor has a very low spatial resolution (900 pixels), which is a key feature to ensure a cheap technology and to maintain the user's privacy. The low-resolution visual sensor has shown promising results for analyzing the activities of senior citizens²⁻⁵. Firstly, the visual sensor is installed in a top view setup at the door entrance. Secondly, a correlation-based foreground detection method is used to extract the foreground. Thirdly, an Extra Trees Classifier (ETC) is trained to classify the directionality of the person (in/out) based on the motion of the foreground pixels. Due to the nature of variability of the out-of-home activity, the relative frequency of the directionality (in/out) is measured over a window of 3 seconds to determine the final result.

Results & Discussion We installed our system in 9 different service flats in the UK, Belgium and France where the same ETC model is used. We evaluated our method on video sequences captured in real-life environments from the different setups, where the persons' out-of-home routines are recorded. Table 1 shows the comparison between the ground truth and estimated results of two service flats in Belgium and one service flat in the UK. The results show that our approach of detecting out-of-home activity achieves an accuracy of 91.30%. We plan to collect more data from the other service flats for a long-term out-of-home analysis.

References

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Address: UGent-IPI-Iminds, Gent, Belgium;

E: mohamed.eldib@telin.ugent.be

Table 1: Confusion matrix for out-of-home analysis

Location	Coming in		Going out	
	Ground truth	Estimated	Ground truth	Estimated
Belgium 1	3	3	3	3
Belgium 2	10	9	9	8
UK 1	11	11	11	8